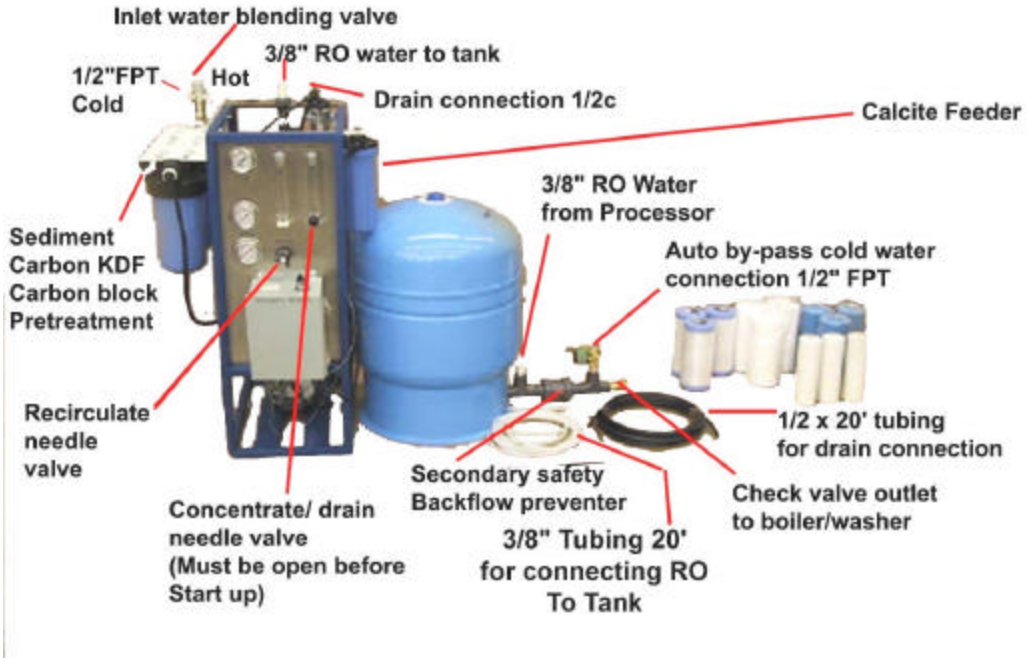
HS - Series Reverse Osmosis Processor
With Built-in Pre-treatment and Membrane Flush

HS-Series
Pressure Tank
Float Tank
Models

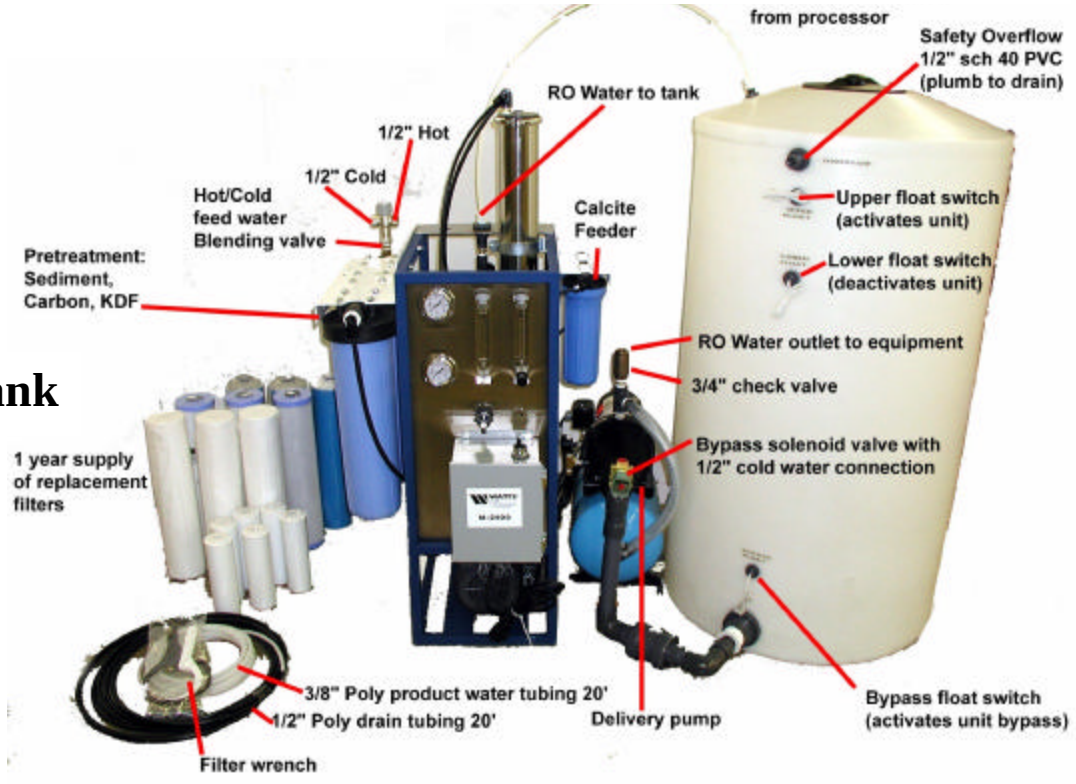
Installation, Operation
&
Maintenance Manual

Before installing and/or operating Watts HS-Series Reverse Osmosis system, read this manual completely. Keep this manual available for future reference. Further information is available by contacting your local Watts distributor. Phone: (623)505-1512

Pressure Tank



Atmospheric Tank



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Specifications Complete System Packages

SPECIFICATIONS	HS-450	HS-1000	HS-2400	HS-4800	HS-9600	HS-15000
DRY WEIGHT lbs.	300	310	350	650	750	950
WET WEIGHT lbs	550	1700	1750	4000	4100	4900

FEED WATER

COLD/Temp	½"/35°-70°	½"/35°-70°	½"/35°-70°	¾"/35°-70°	¾"/35°-70°	1"/35°-70°
HOT/ Temp	½"/70°-140°	½"/70°-140°	½"/70°-140°	¾"/70°-140°	¾"/70°-140°	1"/70°-140°
FLOW RATE	2 GPM	4 GPM	8 GPM	12 GPM	24 GPM	24 GPM
MAX.HARDNESS	17 Grains	17 Grains	17 Grains	17 Grains	17 Grains	17 Grains
MAX. TDS	2500 PPM	2500 PPM	2500 PPM	2500 PPM	2500 PPM	2500 PPM
MAX. IRON	0.1 MGL	0.1 MGL	0.1 MGL	0.1 MGL	0.1 MGL	0.1 MGL
MAX. PSIG	80	80	80	80	80	80
MIM. PSIG	25	25	25	25	25	25

DRAIN CONNECTION

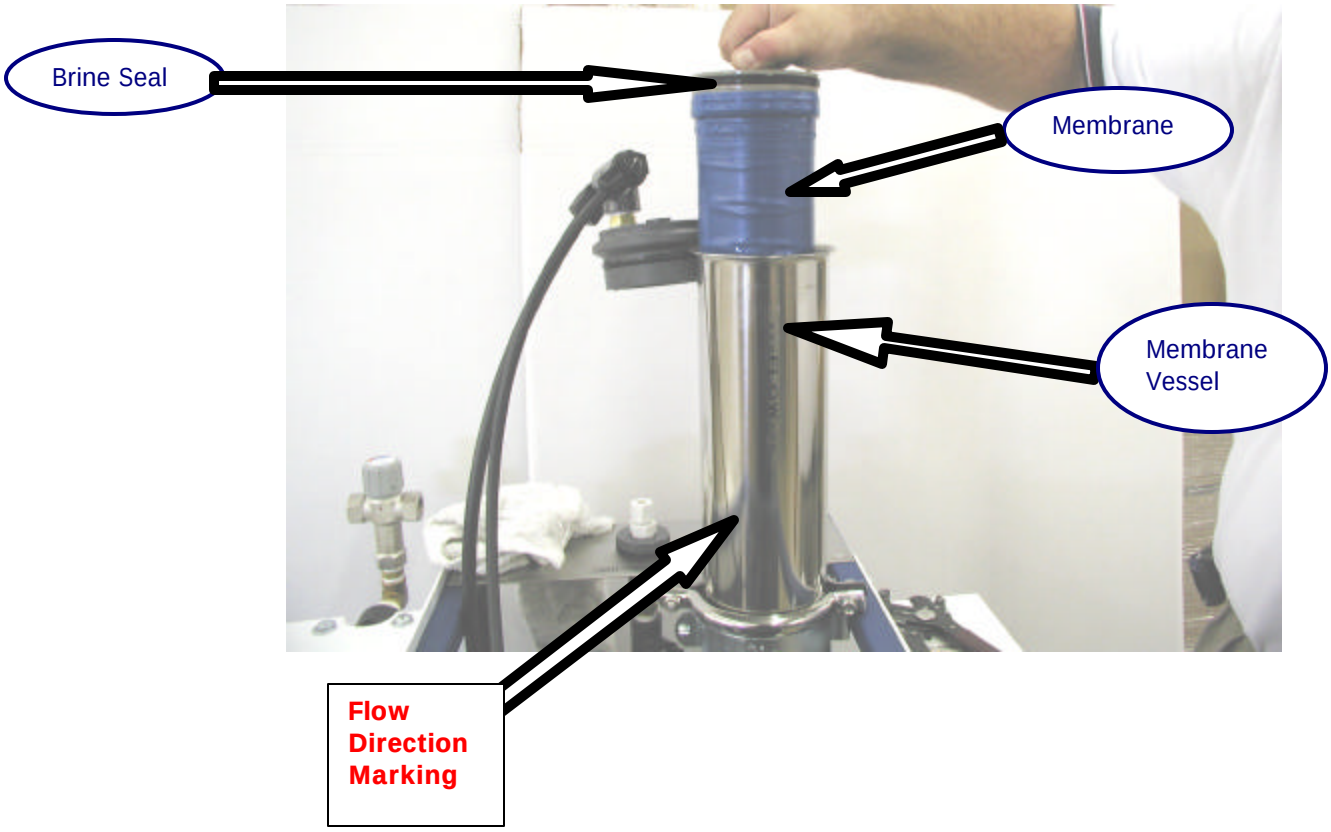
FLOOR SINK MIM. w/in 10 ft of processor	1/ ¼"	1/ ¼"	1/ ¼"	1/ ¼"	1/ ¼"	1/ ¼"

ELECTRICAL REQUIRMENTS	VOLTS/AMPS	VOLTS/AMPS	VOLTS/AMPS	VOLTS/AMPS	VOLTS/AMPS	VOLTS/AMPS
RO PROCESSOR OPTIONAL 220V	115/7.2	115/7.2	115/11.0 220/8.8	115/23 220/11.5	220/11.5	220/11.5
DELIVERY PUMP	N/A	115/8.8	115/12.4	115/12.4	115/12.4	115/12.4
KDF FILTER	N/A	N/A	N/A	115/2	115/2	115/2

Membrane Installation

Note: All Membrane Vessels are clearly marked with flow direction.

Membrane "Brine Seal" is always facing the water entry to Vessel.



Inlet Connection

HOT and/or COLD FEED WATER CONNECTION

Hard plumb Hot and/or Cold water Connections into Blending Valve Using (L) Copper Pipe. Refer to table Below. Valve is marked with HOT and Cold connections.

Recommend installing Ball Valves just prior to the Blending Valve.

NOTE: Use only Teflon tape on all threaded pipe.

RO	FEED WATER MIN/MAX PSIG	PIPE SIZE	FLOW RATE
HS-450	25/80 psig	½"	2 GPM
HS-100	25/80 psig	½"	4 GPM
HS-2400	25/80 psig	½"	8 GPM
HS-4800	25/80 psig	1"	12 GPM
HS-9600	25/80 psig	1 ¼"	24 GPM
HS-15,000	25/80 psig	1 ¼"	24 GPM

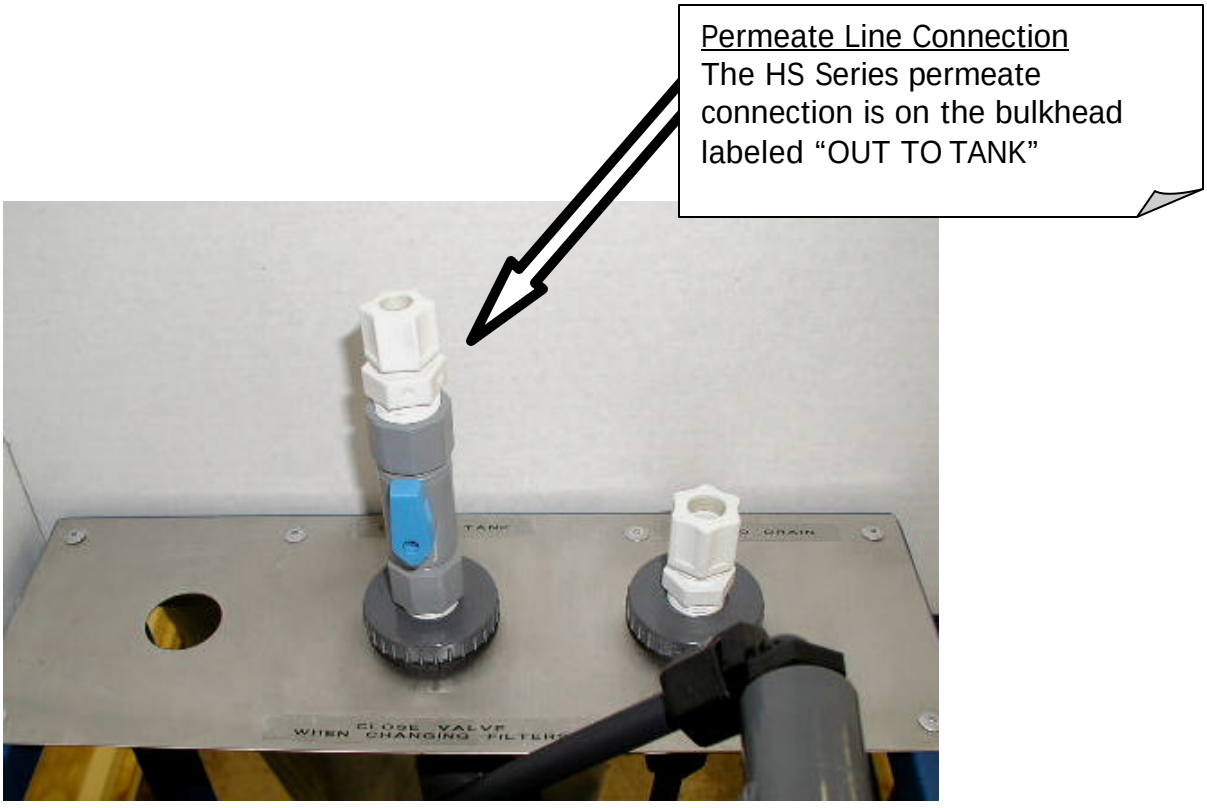
Permeate Line Connection

Required fittings for Bulkhead & Tank
HS450 ½" MPT x 3/8C .
HS1000 ½" MPT x 3/8C
HS2400 ½" MPT x ½"C
HS4800 ¾" MPT x ¾" Female Slip Schedule 40 PVC
HS9600 1" MPT x 1" Female Slip Schedule 40 PVC
HS15,000 1" MPT x 1" Female slip schedule 40/80 PVC

Ball Valve used with Pressure Tank applications.

Note: Fittings are included with systems ordered as complete packages only!

HS-450 – HS2400	½" Tubing or PVC pipe
HS4800 – HS15K	1" PVC Schedule 40 pipe



Pressure Tank Connection

Recommended tubing size
From bulkhead on unit to tank.

Note: Fittings are included with Systems ordered as complete packages only!

HS450 - HS2400
Flexible poly tubing acceptable.

HS4800 – HS15,000
Schedule 80 PVC required.

HS-450	**3/8”**
HS-1000	**3/8”**
HS-2400	**3/8”**
HS-4800	¾”
HS-9600	¾”
HS-15,000	1”

Note: Copper pipe is UNSUITABLE for any plumbing from RO Storage Tank! Recommended materials include: Braided Stainless Steel Tubing, Hard Stainless. Schedule 80 PVC or Poly Propylene is acceptable, if not being connected to boiler or heating system.

Atmospheric Storage Tank

Bulkhead & Fitting Systems

HS-450	3/8”
HS-1000	3/8”
HS-2400	3/8”
HS-4800	3/4 “
HS-9600	3/4”
HS-15,000	1”

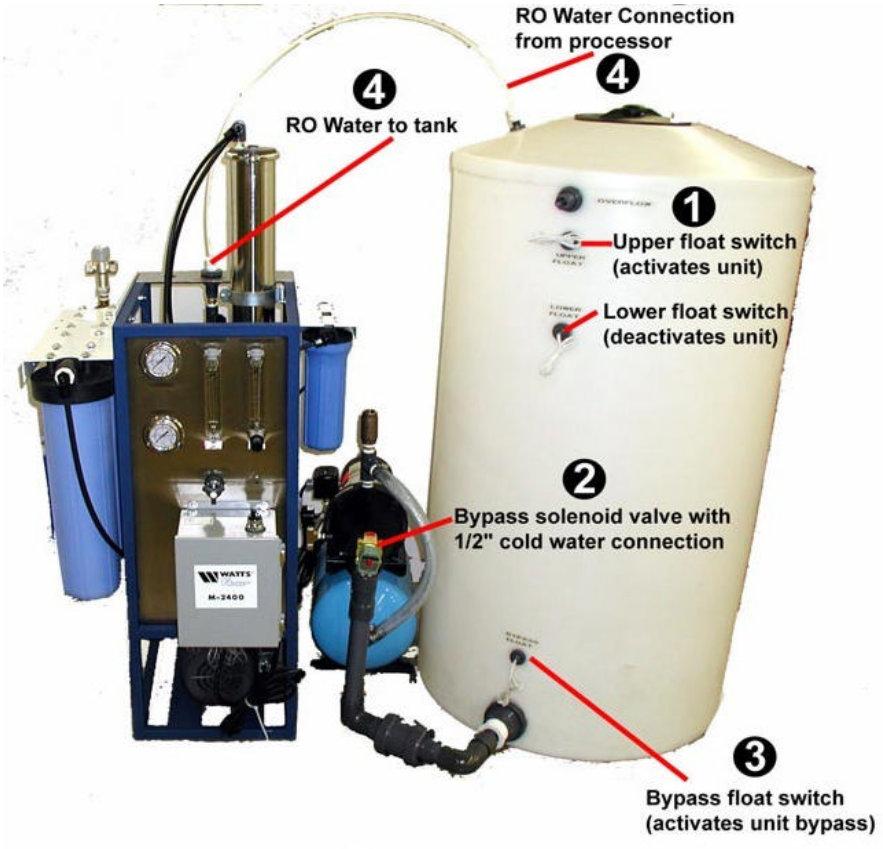
Plumb Drain Connection located on Bulkhead of RO system to floor drain, using table specifications below or appropriate air gap drain with minimum drain size of 1 1/4”.

Note: Refer to local plumbing codes for requirements in your area.

Note: Copper pipe is <u>UNSUITABLE *for* any plumbing from RO Storage tank!

Recommended materials include: Braided Stainless Steel Tubing, Hard Stainless.

Schedule 80 PVC or Poly Propylene, if not being connected to boiler or heating system.

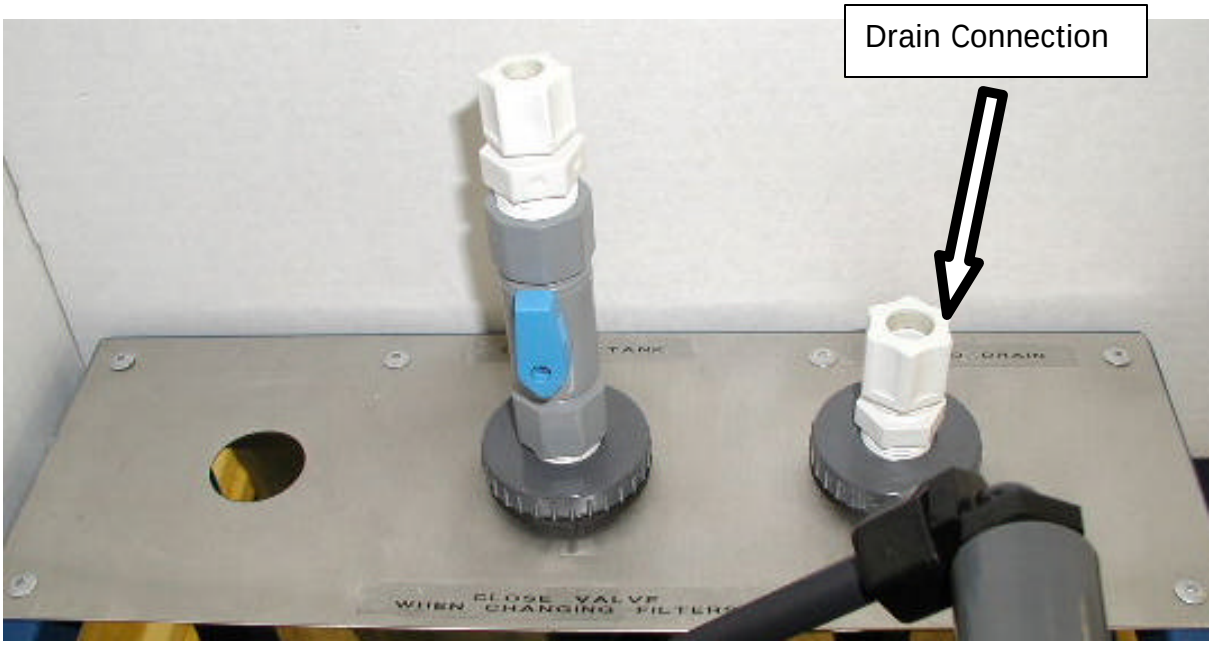


If the HS-Series was ordered with the atmospheric storage tank, the three tank float switches have been installed at the factory. Check to insure the tank floats have not been damaged.

1. Connect the gray electrical cable containing four (4) wires from the M-Series control box to the corresponding electrical connection on the atmospheric tank.
2. Connect the gray electrical cable from Control Box, labeled "By-Pass Solenoid" to the By-Pass Solenoid.
3. Connect the gray electrical cable from Control Box, labeled "By-Pass Float Switch" the By-Pass Float Switch.
4. Using the table below connect the RO processor Bulkhead to the tank using specified tubing or PVC pipe.

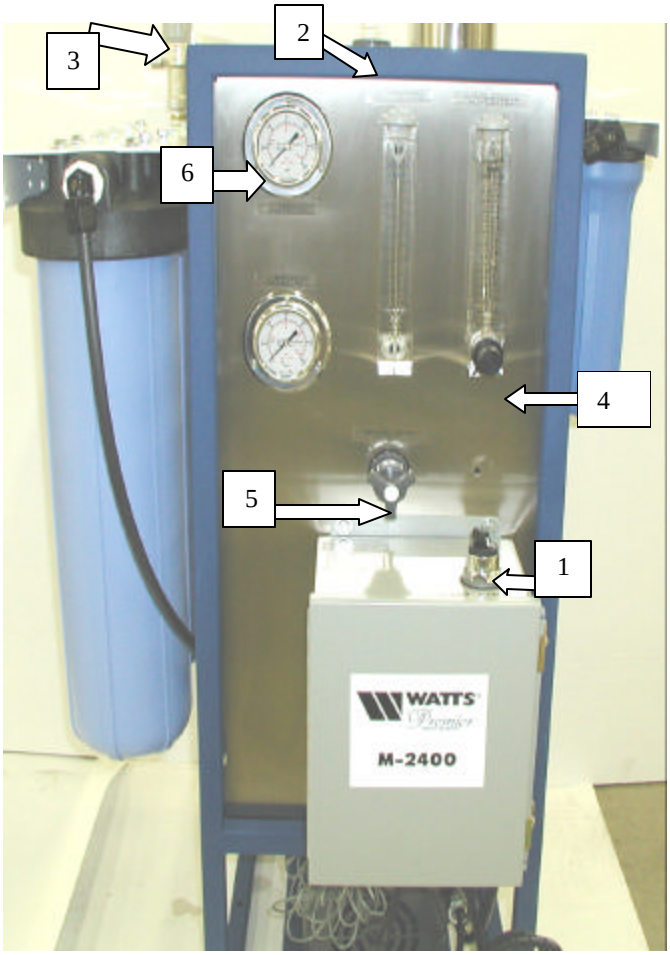
Plumb to Drain

	HS-450	HS-1000	HS-2400	HS-4800	HS-9600-HS15,000
Bulkhead Connection	1/2" Poly	1/2" Poly	1/2" Poly	½" PVC	1" PVC
Drain Size Min.	1 ¼"	1 ¼"	1 ¼'	1 ¼'	1 ¼"



Start Up

- ✓ Ensure power switch (located on top of control Box). (#1) is in the OFF position.
- ✓ Plug the unit into an appropriate power supply.
- ✓ If installing a pressure Tank system, open the Ball Valve (#2) on the Bulkhead.
- ✓ Turn the Blending Valve to coldest setting [90°]. (#3)
- ✓ Fully open the Concentrate Needle (#4) Valve by turning it counter clockwise.
- ✓ Fully close Recirculate Needle Valve (#5) by turning it clockwise.
- ✓ Turn the incoming water supply on the RO processor to the "ON" position.
- ✓ Turn the Power Switch (#1) to "ON" position.
  - The Water inlet solenoid valve will open.
  - There will be a 5 second delay before the pump starts.
  - The system may cycle on and off automatically during initial start up as air is purged from system.
  - Allow the unit to run for 5 minutes while excess air is being purged from system.
- ✓ Close the Concentrate Needle Valve (#4) until the Feed Pressure Gauge(#6) reaches a max. of 150 psig.
- ✓ Open the Recirculation Needle Valve (#5) until the unit Feed Pressure Gauge (#6) drops to 140 psig.
- ✓ Close the Concentrate Needle Valve (#4) until 150 psig is again achieved on the Pump Feed Pressure Gauge (#6).



Repeat **<u>underlined</u>** sequence until both flow meters read equal flows and feed pressure gauge reads 150 psi. At this point the RO processor is operating at its maximum efficiency potential.

If using a Pressure Tank, system will continue to operate until Tank Pressure Gauge reads 60 psig or Float Tank, upper float switch is triggered by the water level.

NOTE: At no time should the Concentrate Valve ever be completely closed. RO system must have some water running to the drain during production or RO water.

NOTE: DO NOT operate over 150 psi, as this will damage membrane. The back pressure will read less than 150 psi.

ALARMS

HS-Series processors are equipped with audible alarms.

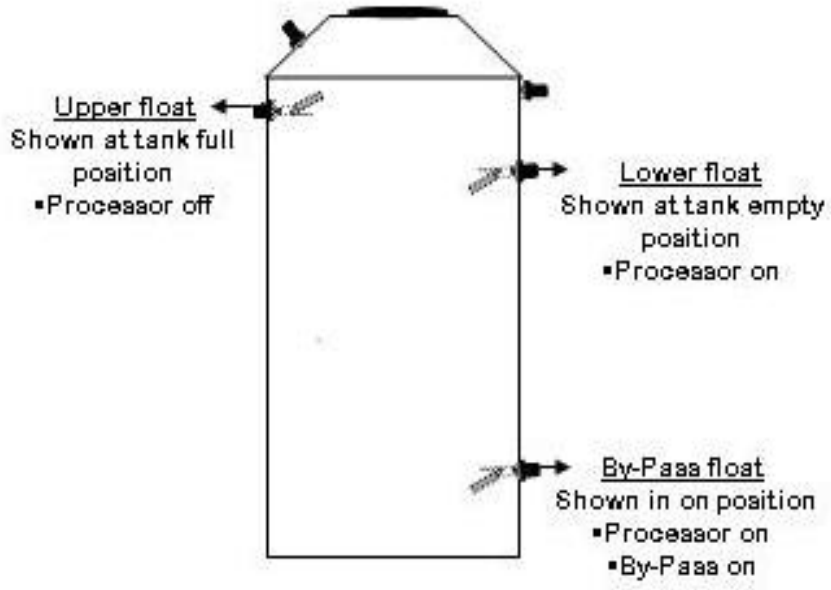
1. The Constant Tone signals lack of incoming water pressure.
   (---------- Constant Tone)
   - Check incoming feed pressure to ensure a minimum of 20 psi.
   - Water pressure below 20 psi will trigger alarm. Incoming feed water pressure must be raised.

2. One second intermittent beeping signals systems is in Auto –Bypass.
   (-- -- -- -- -- -- -- -- -- -- -- -- -- -- One second intermittent tone).

   - During initial start up with empty tank, the system will automatically be in Auto-Bypass until the tank has completely filled. The Auto by pass will only be triggered if the tank pressure drops below 5 psi (Pressure tank systems). Float switch controlled Atmospheric tank systems with float switches, remain on until tank is full and processor has turned off automatically.

3. Two second intermittent beeping indicates possible wiring problem or problem with installation of Float Switches.
   (---- ---- ---- ---- ---- ---- Two second intermittent tone.)

   Solution:
   - Check to ensure labeled electrical cables are connected to corresponding float switches.
   - Check conductivity of wire to ensure no broken wire cables exist.
   - Verify Float position per drawing to the right.



Maintenance

Quarterly Preventive Maintenance for Systems with complete Pre and Post treatment.

The M-Series RO processor requires quarterly preventive maintenance consisting of replacing (3) pre-filters and post Filters if supplied.

1. Pre-filters are located on left side of RO processor.
2. Post filters located on right side of RO processor unit.

Quarterly preventive maintenance procedure.

1. Turn incoming feed water off while unit is running.
2. System will automatically turn off due to lack of feed water pressure.
3. Turn Power Switch to the OFF position.
4. Close Ball Valve on Permeate Line Connection on Bulkhead (Pressure Tank Systems).
5. Unplug unit from Power Supply.
6. Place bucket under pre-filters to catch the water from the filter housings.
7. Using supplied filter wrench, loosen filter housing starting on the left.
8. Replace with new 5 micron Sediment Filter and replace filter housing using wrench to tighten securely.
   (O-rings and Bowls need to be lubricated with a water soluble lubricant such as KY Jelly).
9. Follow the above sequence with remaining filters. and Post Filters if supplied.
10. Replace Calcite Feeder located on right hand side of unit using supplied filter housing wrench.

(Calcite feeder is only needed on units feeding boilers).

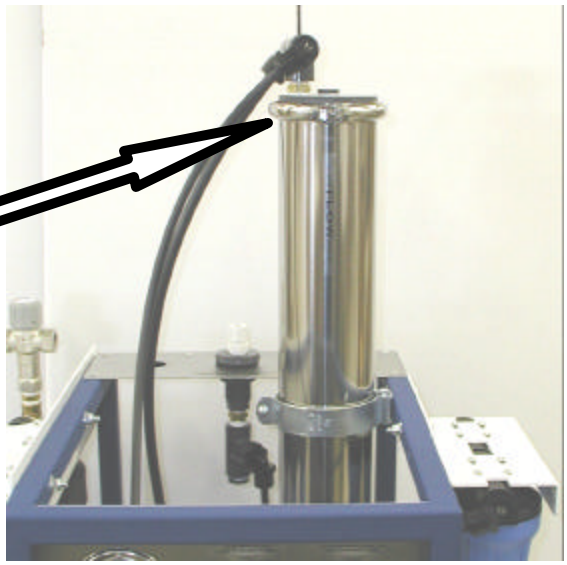
Follow "START UP" procedures on page 11

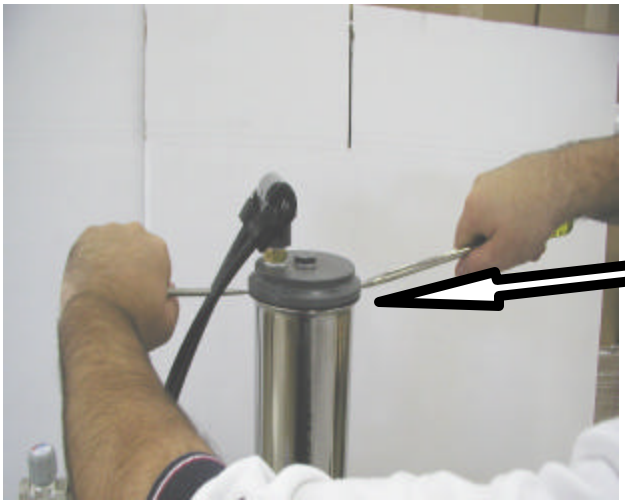
Annual Preventive Maintenance

Perform quarterly preventive maintenance.

Include replacement of O-Rings.

Replace RO membrane by loosen retaining clamp at top of stainless steel membrane vessel.





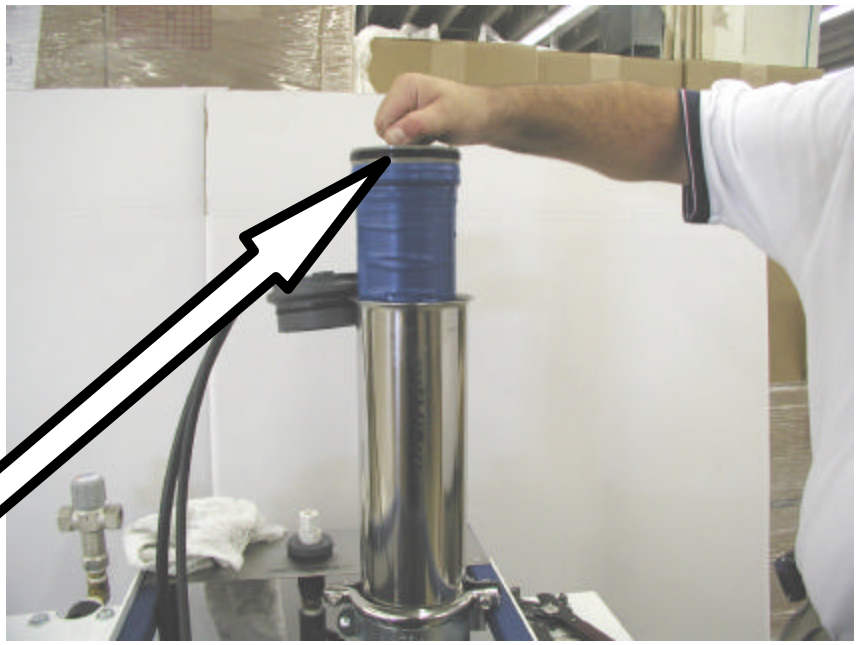
Carefully pry loose PVC end cap from stainless steel vessel.

Pull membrane from vessel using pliers i necessary and discard. Take note of location of black BRINE SEAL located approx. 1/2" from one end of membrane, so the new membrane will be installed in the proper direction.

*Note: If using pliers to remove **NEW** membrane for any reason, protect end of membrane with cloth, to prevent teeth marks which could result in leaks.*

Annual Preventive Maintenance

Lubricate O-Rings on both ends of the Membrane and PVC Vessel Cap with K-Y Jelly or other water soluble lubricant.
*Vaseline or other petroleum based lubricants will damage rubber o-ring and cause leaks.



Insert new membrane into vessel with the Brine Seal on same position as the old one just removed.

Replace PVC end cap and tighten clamp evenly.

WARRANTY

WHAT YOUR WARRANTY COVERS:

If any part of your Watts Pure Water Treatment Device is defective in workmanship (excluding replacement filter elements), return the unit within 1 year of date of original purchase. Watts will repair or, at WATTS option, replace it at no charge.

HOW TO OBTAIN WARRANTY SERVICE:

Contact WATTS customer service department (1-888-774-7405) to obtain a Return Goods Authorization Number (RGA#). Model and Serial Number are required for obtaining an RGA #. For warranty service, ship your water treatment device with the RGA # printed on the Shipping Label to Watts, freight and insurance prepaid, with proof of original purchase date. Watts will repair or replace the water treatment device and ship it back to you prepaid.

WHAT YOUR WARRANTY DOES NOT COVER:

This warranty does not cover defects resulting from improper installation, customer abuse, misuse, misapplication, improper maintenance, neglect, alteration, accidents, casualties, fire, flood, freezing, heat, environmental factors or acts of nature.

This warranty will be voided if defects occur due to failure to observe the following conditions:

1. The water treatment device must be hooked up to a potable municipal water supply.
2. The pH of incoming water must not be lower than 6.0 or higher than 8.5.
3. The incoming water pressure must be between 25 psi and 80 psi. If water pressure exceeds 80 psi a pressure regulator must be installed.
4. Incoming water temperature cannot exceed 100° F (40° C).

This warranty does not cover any equipment that has been relocated from the site of its original installation.

This warranty does not cover equipment that is installed outside North America.

LIMITATIONS AND EXCLUSIONS:

Watts WILL NOT BE RESPONSIBLE FOR ANY IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

WATTS WILL NOT BE RESPONSIBLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING TRAVEL EXPENSES, TELEPHONE CHARGES, LOSS OF REVENUE, LOSS OF TIME, INCONVENIENCE, LOSS OF USE OF THE EQUIPMENT, AND DAMAGES CAUSED BY THE EQUIPMENT AND ITS FAILURE TO FUCTION PROPERLY.

THIS WARRANTY SETS FORTH ALL OF WATTS'S RESPONSIBILITIES REGARDING THIS EQUIPMENT.

OTHER CONDITIONS: IF Watts chooses to replace the equipment, Watts may replace it with reconditioned equipment. Parts used in repairing or replacing the equipment will be warranted for 90 days from the date the equipment is returned to you or for the remainder of the original warranty period, whichever is longer. This warranty is not assignable or transferable.

YOUR RIGHTS UNDER STATE LAW:
Some states do not allow limitations on how long an implied warranty lasts and some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights. You may have other legal rights, which vary from state to state.

GLOSSARY OF TERMS

Atmospheric tank: A storage container requiring additional delivery system to distribute stored water. Typically constructed of polyurethane or stainless steel. Used in situations where greater storage capacity is needed than offered by conventional pressure tanks.

Auto By-Pass: A feature that allows tap water to be delivered to downstream demands in the event the RO processor is unable to meet demand.

Brine Seal: A black "O-ring type seal located on one end of membrane that seals the membrane to the vessel preventing cross contamination of process water and feed-water.

Calcite Feeder: Calcite is a naturally occurring mineral used to raise the Total Dissolved Solids (TDS) in the water to promote conductivity in the final product water. Used in situations where conductivity is needed for proper equipment function i.e. conductivity probes.

Carbon Block: Acid washed carbon is used to absorb VOC's (Volatile Organic Chemicals) such as herbicides, pesticides and chlorine, which will damage RO membranes.

Concentrate needle valve: A needle valve located on the right side flow meter that controls the concentrate (drain water) water flow to the drain.

Concentrate: Water being rinsed to drain after it has been rejected by the membrane.

Concentrate Line: Tubing or pipe used to transport concentrated waste water to a suitable drain.

Feed pressure: Referring to the water pressure being supplied to the RO processor before it has entered the pre-filter. Raw water.

Feed pressure gauge: The upper most gauge on the control panel that indicates the water pressure the membrane is receiving.

Flow meter: A meter that reads water flow in gallons/liters per minute

GPM: Gallons per minute

GPD: Gallons per day

Hardness: Total quantity of CaCO3 (Calcium/magnesium) present in water.

1 gr. = 17.1 TDS in ppm per U.S. gallon

Iron: A naturally occurring mineral that has detrimental effects on a membranes ability to produce water. Reduced by ion exchange (water softening) or KDF media.

KDF Media Filter: A proprietary blend of metals and other substances that help reduce Iron and CaC03 (hardness). Used as pretreatment on some models of high production RO systems.

L Copper pipe: A high grade of copper pipe that will withstand water temperatures up to 160 degrees Fahrenheit.

Membrane: A thin sheet or surface film, either natural or man-made, of microporus structure that performs as an efficient filter of particles down to the size rang of chemical molecules and ions. Such membranes are termed "semi-permeable" because some substances will pass through but others will not. Usually small ions, water, solvents, gases, and other very small molecules can pass through a membrane, but other ions and macromolecules such as proteins and colloids are barred form passage. Membranes are used in reverse osmosis.

GLOSSARY OF TERMS (Continued)

Permeate: That portion of the feed water which passes through the membrane to become product water.

Permeate Line: Tubing or pipe used to transport purified (RO processed) water from processor to the storage tank.

Pressure tank: A water storage device using a pressurized bladder that provides delivery pressure to down stream uses.

Purge: The act of flushing out. A term to describe the purging of entrained air in a system

Recirculation Valve: A needle control valve used to blend concentrate water past the membrane again to scavenge water molecules.

Recirculation Ratio: The ratio in which concentrate water is reticulated past the membrane in order to osmoisize more water molecules and reduce the wasted ratio of water. Typical recirculation ratio is 1:1 (1 gallon permeate: 1 gallon concentrate

Reverse Osmosis: A water treatment process that removes undesirable material from water by using pressure to force the water molecules through a semi-permeable membrane. This process is called "reverse" osmosis because the pressure forces the water to flow in the reveres direction (from the concentrated solution to the dilute solution) to the flow direction (from the dilute to the concentrated) in the process of natural osmosis. RO removes ionized salts, colloids, and organic molecules down to a molecular weigh of 100. May be called hyper-filtration.

RO: Reverse Osmosis

RO Processor: The system main stand, that consists of the main frame, pump, electrical controls, flow meters and pressure gauges. A term used to signify a specific piece of the overall system.

Sediment Filter: A filter used to trap and reduce rust, dirt and sand. Typically made from spun poly.

TDS: Total Dissolved Solids, the total weight of dissolved matter present in water that does not constitute pure water molecules. Measured in the form of resistively and or conductivity equated into TDS in ppm (parts per million per 1 U.S. gallon)

VOC: Volatile Organic Chemicals, synthetic organic chemicals that turn into vapor at relatively

Zero Soft Water: Water produced by Reverse Osmosis measuring less than 1/0 grain per U.S. gallon (17.1 ppm or 17.1 mg/L) as calcium carbonate.